

Technical Evaluation Report™

TER 1407-06

DRYline® TSX (Red) and TSX ADVANCED AMP (Red) Structural Sheathing

National Shelter Products, Inc.

Products:

**DRYline® TSX (Red)
and TSX ADVANCED
AMP (Red) Structural
Sheathing**

Issue Date:

August 11, 2014

Revision Date:

January 9, 2023

Subject to Renewal:

January 1, 2024



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SECTION: 06 12 00 - Structural Panels

SECTION: 06 12 19 - Shear Wall Panels

SECTION: 06 16 00 - Sheathing

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

SECTION: 07 25 00 - Water-Resistive Barriers/Weather Barriers

SECTION: 07 27 00 - Air Barriers

1 Products Evaluated^{1,2}

- 1.1 DRYline® TSX (Red) Structural Sheathing
 DRYline® TSX ADVANCED AIR AND MOISTURE PROTECTION (AMP) (Red) Structural Sheathing

2 Applicable Codes and Standards³

- 2.1 Codes
 - 2.1.1 IBC—15, 18, 21: International Building Code®
 - 2.1.2 IRC—15, 18, 21: International Residential Code®
 - 2.1.3 IECC—15, 18, 21: International Energy Conservation Code®
 - 2.1.4 FBC-B—17, 20: Florida Building Code – Building⁴
 - 2.1.5 FBC-R—17, 20: Florida Building Code – Residential⁴

¹ For more information, visit drjcertification.org or call us at 608-310-6748.

² This TER is a code defined research report provided by an approved source (see IBC Section 1703.4.2) and an approved agency (see IBC Section 1703.1). Given that this TER is for new materials, as defined in IBC Section 1702, for which there are no approved rules or standards, IBC Section 1707.1 states that, "In the absence of approved rules or other approved standards, the building official shall accept duly authenticated reports (i.e., research reports) from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in IBC Section 104.11." A professional engineer is approved as an approved source when that professional engineer is properly licensed to transact engineering commerce.

³ Unless otherwise noted, all references in this TER are from the 2021 version of the codes and the standards referenced therein. This material, design, or method of construction also complies with the 2000-2018 versions of the referenced codes and the standards referenced therein.

⁴ All references to the FBC-B and FBC-R are the same as the 2018 IBC and 2018 IRC, respectively, unless otherwise noted in the supplement at the end of this document.

2.2 Standards and Referenced Documents

- 2.2.1 *ANSI/AWC SDPWS: Special Design Provisions for Wind and Seismic*
- 2.2.2 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*
- 2.2.3 *ASTM D7989: Standard Practice for Demonstrating Equivalent In-Plane Lateral Seismic Performance to Wood-Frame Shear Walls Sheathed with Wood Structural Panels*
- 2.2.4 *ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction*
- 2.2.5 *ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials*
- 2.2.6 *ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*
- 2.2.7 *ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*
- 2.2.8 *ASTM E2178: Standard Test Method for Air Permeance of Building Materials*

3 Performance Evaluation

- 3.1 Testing and related engineering evaluations are defined as intellectual property and/or trade secrets.
- 3.2 DRYline® TSX (Red) Structural Sheathing was evaluated to determine:
 - 3.2.1 Structural performance under lateral load conditions (wind and seismic) for use as an alternative to the IRC Intermittent Wall Bracing provisions of [IRC Section R602.10](#) Method WSP (wood structural panel).
 - 3.2.2 Structural performance under lateral load conditions for use as an alternative to the IRC Continuous Wall Bracing provisions of [IRC Section R602.10.4](#) Methods CS-WSP (continuously sheathed wood structural panel) and CS-PF (continuously sheathed portal frame).
 - 3.2.3 Structural performance under lateral load conditions for use as an alternative to the IRC Continuous Wall Bracing provisions of [IRC Section R602.10.6.2](#) Method PFH (portal frame with hold-down).
 - 3.2.4 Structural performance under lateral load conditions for use as an alternative to the IBC Conventional Wall Bracing provisions, [IBC Section 2308.6](#), Method WSP, for Type V construction.
 - 3.2.5 Structural performance under lateral load conditions for both wind and seismic loading for use with the IBC performance-based provisions, [IBC Section 2306.1](#) and [IBC Section 2306.3](#) for light-frame wood wall assemblies.
 - 3.2.5.1 The basis of the seismic evaluation performed as part of this TER is based on ASTM D7989 and testing per ASTM E2126 to establish SDCs that conform to the requirements of ASCE 7 Section 12.2.1.1.
 - 3.2.5.2 Table 6 provides seismic design coefficients (SDC) that conform to the requirements in ASCE/SEI 7 Section 12.2.1 and Table 12.2-1 for design of wall assemblies in buildings that require seismic design in accordance with ASCE/SEI 7 (i.e., all seismic design categories).
 - 3.2.5.3 The basis for equivalency testing is outlined in Section 12.2.1.1 of ASCE/SEI 7:

Use of seismic force-resisting systems not contained in Table 12.2-1 shall be permitted contingent on submittal to and approval by the Authority Having Jurisdiction and independent structural design review of an accompanying set of design criteria and substantiating analytical and test data. The design criteria shall specify any limitations on system use, including Seismic Design Category and height; required procedures for designing the system's components and connections; required detailing; and the values of the response modification coefficient, R ; overstrength factor Ω_0 ; and deflection amplification factor, C_d .

- 3.2.5.4 The SDC evaluation uses the approach found in documentation entitled “Establishing Seismic Equivalency for Proprietary Prefabricated Shear Panels: An Introduction to the Process”⁵ using code-defined accepted engineering procedures, experience and technical judgment.
- 3.2.6 Structural performance under lateral load conditions for use as an alternative to SDPWS Section 4.3 Wood-Frame Shear Walls.
- 3.2.7 Resistance to transverse loads for wall assemblies used in light-frame wood construction in accordance with IBC Section 1609.1.1 and IRC Section R301.2.1
- 3.2.8 Resistance to uplift loads for wall assemblies used in light-frame wood construction in accordance with IBC Section 1609 and IRC Section R301.2.1.
- 3.2.9 Performance for use as a water-resistive barrier (WRB) in accordance with IBC Section 1403.2⁶ and IRC Section R703.2.
- 3.2.10 Performance for use as an air barrier material in accordance with IRC Section N1102.4.1.1, IECC Section R402.4.1.1, and IECC Section C402.5.1.1.
- 3.3 Use of DRYline® TSX (Red) Structural Sheathing in draftstop applications is outside the scope of this evaluation. For this application, see TER 1407-10.
- 3.4 Engineering evaluations are conducted with DrJ’s ANAB accredited ICS code scope, which are also its areas of professional engineering competence.
- 3.5 Any regulation specific issues not addressed in this section are outside the scope of this TER.

4 Product Description and Materials

4.1 The product evaluated in this TER is shown in Figure 1.

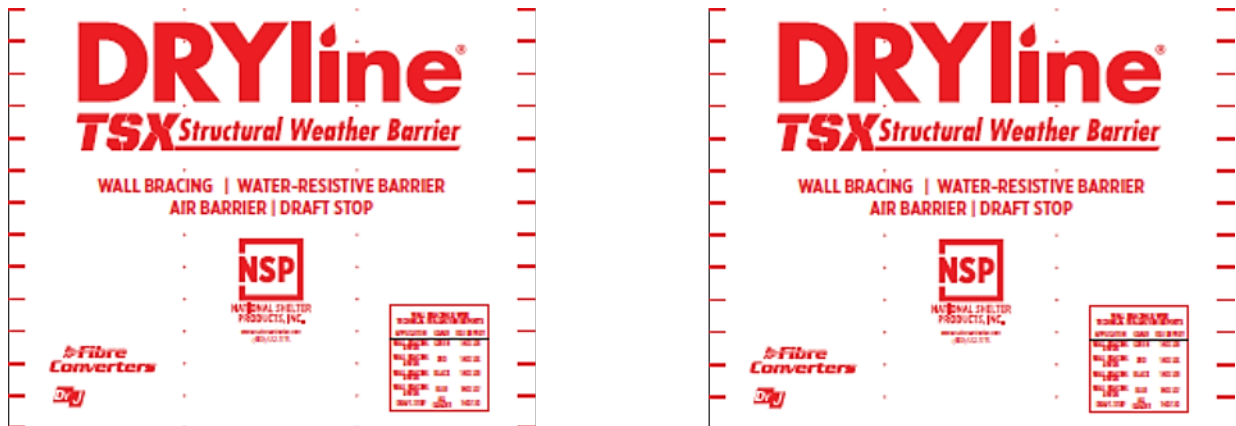


Figure 1. DRYline® TSX (Red) Structural Sheathing

4.2 DRYline® TSX (Red) Structural Sheathing is a proprietary wall sheathing consisting of a proprietary fibrous sheathing board laminated with a water-resistant adhesive to facers on one or both sides. Facers may consist of aluminum foil, polyolefin film, aluminized polyolefin, or kraft paper.

4.2.1 Material Availability

- 4.2.1.1 Thickness: 0.108" (2.67 mm).
- 4.2.1.2 Standard product width: 48" (1219 mm) or 48¾" (1238 mm).
- 4.2.1.3 Standard lengths: 96" (2438 mm), 108" (2743 mm), 120" (3048 mm), and other sizes are available by request.

⁵ <http://www.structuremag.org/wp-content/uploads/2014/08/C-StructuralPerformance-Nelson-Aug081.pdf>

⁶ 2015 IBC Section 1404.2

5 Applications

5.1 General

- 5.1.1 DRYline® TSX (Red) Structural Sheathing is used as wall sheathing in buildings constructed in accordance with the IRC and IBC for light-frame wood construction.
- 5.1.2 DRYline® TSX (Red) Structural Sheathing is used as structural wall sheathing to provide lateral load resistance (wind and seismic) for braced wall panels used in light-frame wood construction.
- 5.1.3 DRYline® TSX (Red) Structural Sheathing panels are permitted to be used as wall sheathing in buildings constructed in accordance with the IBC requirements for Type V light-frame construction.
- 5.1.4 DRYline® TSX (Red) Structural Sheathing panels are used as structural wall sheathing to provide resistance to transverse loads for wall assemblies used in light-frame wood construction.
- 5.1.5 DRYline® TSX (Red) Structural Sheathing is used to provide resistance to uplift loads for wall assemblies used in light-frame wood construction.
- 5.1.6 DRYline® TSX (Red) Structural Sheathing is used as a non-structural wall sheathing applied as in-fill to portions of walls that are not designed as shear walls.
- 5.1.7 When DRYline® TSX (Red) Structural Sheathing is installed in accordance with Section 5.3 and Section 6, it is an approved alternative WRB in accordance with [IBC Section 1403.2⁷](#) and [IRC Section R703.2](#).
- 5.1.8 DRYline® TSX (Red) Structural Sheathing is an approved air barrier material when installed in accordance with Section 5.4 and Section 6.

5.2 Structural Applications

5.2.1 General Structural Provisions

- 5.2.1.1 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgement.
- 5.2.1.2 Except as otherwise described in this TER, DRYline® TSX (Red) Structural Sheathing shall be installed in accordance with the applicable building codes listed in Section 2 using the provisions set forth herein for the design and installation of wood structural panels (WSP).
 - 5.2.1.2.1 DRYline® TSX (Red) Structural Sheathing is permitted to be designed in accordance with SDPWS for the design of shear walls using the methods set forth therein, including the perforated shear wall methodology, and subject to the SDPWS boundary conditions, except as specifically allowed in this TER.
- 5.2.1.3 Anchorage for in-plane shear shall be provided to transfer the induced shear force into and out of each shear wall.
 - 5.2.1.3.1 For wind design, anchor bolt spacing shall not exceed 6' o.c. (1829 mm).
 - 5.2.1.3.2 For seismic design, anchor bolt spacing shall not exceed 4' o.c. (1219 mm).
- 5.2.1.4 The maximum aspect ratio for DRYline® TSX (Red) Structural Sheathing shall be 4:1.
- 5.2.1.5 The minimum full height panel width shall be 24" (610 mm).
- 5.2.1.6 All panel edges shall be supported with a minimum 2" (51 mm) nominal lumber.
- 5.2.1.7 Staples shall have a minimum 16 gauge, 15/16" crown and penetrate a minimum of 1" into the stud.
- 5.2.1.8 Installation is permitted for single top plate (advanced framing method) or double top plate applications.

⁷ 2015 IBC Section 1404.2

- 5.2.1.9 Where the sheathing from an upper story extends over the rim joist and overlaps a lower story, the sheathing shall be fastened along the sole plate of the story above at 3" o.c. Further, one row of fasteners spaced 12" o.c. shall be located along the bottom third of the rim joist. The sheathing from the story above shall overlap the sheathing on the story below by a minimum of 2". Fastening along the bottom edge of the sheathing from the story above is not required.
- 5.2.1.10 When an I-Joist is used as the rim joist and where the sheathing from an upper story extends over the rim joist and overlaps a lower story, the sheathing shall be fastened along the sole plate of the story above at 3" o.c. Further, one row of fasteners spaced 12" o.c. shall be located along the bottom flange of the rim joist or along the top plate of the lower story. The sheathing from the story above shall overlap the sheathing on the story below by a minimum of 2".
- 5.2.1.11 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with code-defined accepted engineering procedures, experience, and technical judgment.

5.2.2 *Prescriptive IRC Bracing Applications*

- 5.2.2.1 DRYline® TSX (Red) Structural Sheathing may be used on braced wall lines as an equivalent alternative to Method WSP of the IRC, when installed in accordance with [IRC Section R602.10](#) and this TER.
- 5.2.2.2 For wind design, required braced wall panel lengths for DRYline® TSX (Red) Structural Sheathing shall be as shown in Table 1, and shall be used in conjunction with [IRC Table R602.10.3\(2\)](#), which provides the required adjustments.
- 5.2.2.3 For seismic design, required braced wall panel lengths for DRYline® TSX (Red) Structural Sheathing shall be as shown in Table 2, and shall be used in conjunction with [IRC Table R602.10.3\(4\)](#), which provides the required adjustments.
- 5.2.2.4 Use of DRYline® TSX (Red) Structural Sheathing with Method CS-PF is permitted in accordance with Section 5.2.3 in lieu of WSP specified in accordance with [IRC Section R602.10.6.4](#).
- 5.2.2.5 Use of DRYline® TSX (Red) Structural Sheathing with Method PFH is permitted in accordance with Section 5.2.4 in lieu of WSP specified in accordance with [IRC Section R602.10.6.4](#).
- 5.2.2.6 Where a building, or portion thereof, does not comply with one or more of the bracing requirements within the prescriptive section of the IRC, those portions shall be designed and constructed in accordance with [IRC Section R301.1](#).



Table 1. Required Bracing Lengths for DRYline® TSX (Red) Structural Sheathing Installed with ½" Gypsum Wallboard @ 16" o.c. Stud Spacing – Wind (V_{ult})^{1,2,3,4,5,6}

Condition	Braced Wall Line Spacing	DRYline® TSX (Red) Structural Sheathing Intermittent Sheathing					DRYline® TSX (Red) Structural Sheathing Continuous Sheathing				
		Nails or Staples 3" o.c. Edges & in the Field					Nails or Staples 3" o.c. Edges & in the Field				
		Length of Wall Line to be Braced (ft)					Length of Wall Line to be Braced (ft)				
		≤ 110 mph	≤ 115 mph	≤ 120 mph	≤ 130 mph	≤ 140 mph	≤ 110 mph	≤ 115 mph	≤ 120 mph	≤ 130 mph	≤ 140 mph
One Story or the Top of Two or Three Stories	10	1.7	1.7	2.2	2.2	2.6	1.3	1.7	1.7	2.2	2.2
	20	3.0	3.0	3.5	4.4	4.8	2.6	3.0	3.0	3.5	4.4
	30	4.4	4.8	5.2	6.1	7.0	3.9	3.9	4.4	5.2	6.1
	40	5.7	6.1	7.0	7.8	9.1	4.8	5.2	5.7	6.5	7.8
	50	7.0	7.8	8.3	9.6	11.3	6.1	6.5	7.0	8.3	9.6
	60	8.3	9.1	10.0	11.3	13.1	7.0	7.8	8.3	9.6	11.3
First Story of Two Stories or Second Story of Three Stories	10	3.0	3.5	3.9	4.4	5.2	2.6	3.0	3.0	3.9	4.4
	20	5.7	6.5	7.0	8.3	9.6	4.8	5.7	6.1	7.0	7.8
	30	8.3	9.1	10.0	11.7	13.5	7.0	7.8	8.3	10.0	11.3
	40	10.9	11.7	13.1	15.2	17.4	9.1	10.0	10.9	13.1	14.8
	50	13.5	14.4	15.7	18.7	21.3	11.3	12.2	13.5	15.7	18.3
	60	15.7	17.4	18.7	21.8	25.2	13.5	14.8	16.1	18.7	21.8
First Story of Three Stories	10	4.8	5.2	5.7	6.5	7.4	3.9	4.4	4.8	5.7	6.5
	20	8.7	9.6	10.0	11.7	13.9	7.4	7.8	8.7	10.0	11.7
	30	12.2	13.5	14.8	17.0	20.0	10.4	11.3	12.6	14.8	17.0
	40	16.1	17.4	19.1	22.2	25.7	13.5	14.8	16.1	19.1	21.8
	50	19.6	21.3	23.5	27.4	31.8	16.5	18.3	20.0	23.1	27.0
	60	23.1	25.2	27.8	32.6	37.4	20.0	21.8	23.5	27.4	31.8

SI: 1 in = 25.4 mm

- Where gypsum wallboard is not applied to the interior side of the wall assembly, bracing lengths shall be multiplied by a factor of 1.8.
- Where panel joints are lapped, bracing lengths may be multiplied by a factor of 0.9.
- Demonstrates equivalency to [IRC Table R602.10.3\(1\)](#). All adjustment factors from [IRC Table R602.10.3\(2\)](#) shall be applied. Except when used with method CS-PF, a minimum of ½" gypsum sheathing shall be applied to the interior side of the wall assembly and fastened with a minimum 5d cooler nails or ¼" #6 types W or S screws spaced 8" o.c. at panel edges and 8" o.c. in the field of the panels. Where gypsum is attached with fasteners spaced 16" o.c. at panel edges and 16" o.c. in the field of the panels, multiply the bracing lengths above by a factor of 1.3.
- DRYline® TSX (Red) shall be installed with minimum 0.120" x 1¼" galvanized roofing nail or minimum 15/16" crown x 1¼" leg 16 gauge galvanized staple.
- Linear interpolation is permitted.
- Wind speeds shown are V_{ult} in accordance with ASCE 7-10 and ASCE 7-16. To convert to equivalent V_{asd} wind speed, $V_{asd} = V_{ult} / 1.26$.



Table 2. Required Bracing Lengths for DRYline® TSX (Red) Structural Sheathing with ½" Gypsum Wallboard @ 16" o.c. Stud Spacing – Seismic^{1,2,3,4,5,6}

Condition	Braced Wall Line Spacing	DRYline® TSX (Red) Structural Sheathing Intermittent Sheathing				DRYline® TSX (Red) Structural Sheathing Continuous Sheathing			
		Nails or Staples 3" o.c. Edges & in the Field				Nails or Staples 3" o.c. Edges & in the Field			
		Minimum Length of Braced Wall Panels Required Along Each Braced Wall Line (ft)				Minimum Length of Braced Wall Panels Required Along Each Braced Wall Line (ft)			
		SDC C (townhouses only)	SDC D ₀	SDC D ₁	SDC D ₂	SDC C (townhouses only)	SDC D ₀	SDC D ₁	SDC D ₂
One Story or the Top of Two or Three Stories	10	1.4	1.5	1.7	2.2	1.2	1.4	1.5	1.8
	20	2.8	3.1	3.5	4.4	2.4	2.7	3.0	3.7
	30	4.2	4.7	5.2	6.6	3.6	4.0	4.4	5.5
	40	5.5	6.3	7.0	8.7	4.7	5.3	5.9	7.4
	50	7.0	7.8	8.7	10.9	5.9	6.7	7.4	9.2
First Story of Two Stories or Second Story of Three Stories	10	2.6	3.3	3.9	4.8	2.3	2.8	3.3	4.1
	20	5.2	6.6	7.8	9.5	4.4	5.5	6.7	8.2
	30	7.8	9.8	11.7	14.3	6.7	8.4	10.0	12.2
	40	10.5	13.0	15.7	19.1	8.9	11.1	13.3	16.3
	50	13.0	16.4	19.6	23.9	11.1	13.9	16.6	20.4
First Story of Three Stories	10	3.9	4.6	5.2	NP	3.3	3.9	4.4	NP
	20	7.8	9.1	10.5	NP	6.7	7.8	8.9	NP
	30	11.7	13.7	15.7	NP	10.0	11.7	13.3	NP
	40	15.7	18.2	20.9	NP	13.3	15.6	17.7	NP
	50	19.6	22.9	26.1	NP	16.6	19.4	22.2	NP

SI: 1 in = 25.4 mm

- Where gypsum wallboard is not applied to the interior side of the wall assembly, bracing lengths shall be multiplied by a factor of 1.8.
- Where panel joints are lapped, bracing lengths may be multiplied by a factor of 0.9.
- Demonstrates equivalency to IRC Table R602.10.3(3). All adjustment factors from IRC Table R602.10.3(4) shall be applied. Except when used with method CS-PF, a minimum of ½" gypsum sheathing shall be applied to the interior side of the wall assembly and fastened with a minimum 5d cooler nails or 1¼" #6 types W or S screws spaced 8" o.c. at panel edges and 8" o.c. in the field of the panels. Where gypsum is attached with fasteners spaced 16" o.c. at panel edges and 16" o.c. in the field of the panels, multiply the bracing lengths above by a factor of 1.3.
- DRYline® TSX (Red) shall be installed with minimum 0.120" x 1¼" galvanized roofing nail or minimum 15/16" crown x 1¼" leg 16 gauge galvanized staple.
- Tabulated bracing lengths are based on the following:
 - Soil Class D
 - Wall height= 10'
 - 10 psf floor dead load
 - 15 psf roof/ceiling dead load
 - Braced wall line spacing ≤ 25'
- Linear interpolation is permitted.



5.2.3 *DRYline® TSX (Red) Structural Sheathing CS-PF Portal Frame*

- 5.2.3.1 DRYline® TSX (Red) Structural Sheathing CS-PF was tested and evaluated for equivalency to the IRC Method CS-PF (Continuous Sheathed Portal Frame) in accordance with IRC Section R602.10.6.4 and IRC Table R602.10.6.4.
- 5.2.3.2 IRC Section R602.10.5 establishes the contributing length of bracing of the CS-PF. IRC Table R602.10.5 shall be used to determine the equivalent bracing length for the DRYline® TSX (Red) Structural Sheathing CS-PF. The capacity of DRYline® TSX (Red) Structural Sheathing CS-PF exceeds the capacity of the IRC Method CS-WSP and, therefore, is permitted to be substituted for an equivalent length of bracing.
- 5.2.3.3 The DRYline® TSX (Red) Structural Sheathing CS-PF is shown in Figure 2.

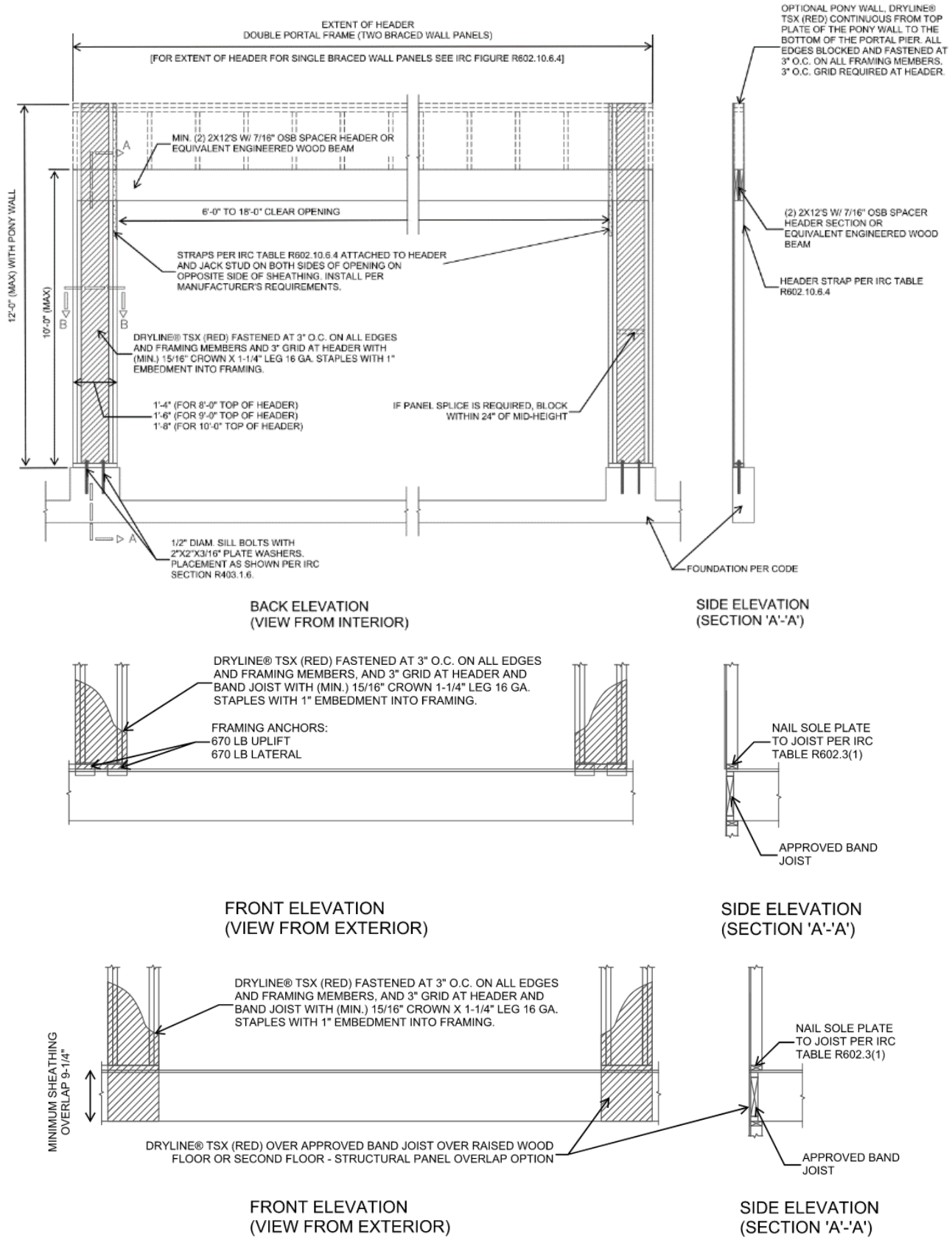


Figure 2. DRYline® TSX (Red) Structural Sheathing CS-PF

5.2.4 DRYline® TSX (Red) Structural Sheathing Method PFH

- 5.2.4.1 In accordance with the IRC Section R602.10.6.2, the PFH referenced in the IRC is permitted to be an equivalent replacement for a 4' length of Method WSP bracing.
- 5.2.4.2 Testing of the DRYline® TSX (Red) Structural Sheathing PFH assemblies was conducted and compared to testing of Method WSP braced wall panel assemblies using oriented strand board (OSB) to determine whether equivalence could be achieved for the DRYline® TSX (Red) PFH.
- 5.2.4.3 The portal frames were tested in accordance with ASTM E2126 testing procedures. Testing determined their lateral resistance within an identical braced wall line using Method WSP braced wall panels so that a direct performance comparison could be made between the two series of tests.
- 5.2.4.4 A comparison of the WSP braced wall lines, and the DRYline® TSX (Red) Structural Sheathing 12" PFH and 24" PFH, is shown in Table 3.

Table 3. Design Values for PFH Option 1 or Option 2^{1,2,3}

Test Name	Sheathing Method	Option	Fastener Size & Spacing	Total Bracing Width (in)	Maximum Wall Height (ft)	ASD Allowable Design Value per Panel/Pier ^{4,5} (lbs)
IBC/IRC Benchmark	¾" OSB, Isolated 4'x8' Panels	N/A	2¾" x 0.113Ø nails, 6:12 spacing	96	Up to 10	700
12" PFH	DRYline® TSX (Red) Structural Sheathing	Option 1	See Figure 3 to Figure 6	12	8	1,280
					10	960
12" PFH	DRYline® TSX (Red) Structural Sheathing	Option 2	See Figure 7 to Figure 9	12	8	1,410
					10	1,060
24" PFH	DRYline® TSX (Red) Structural Sheathing	Option 1 or 2	See Figure 3 to Figure 9	24	8	2,560
					10	1,920

SI: 1 in = 25.4 mm, 1 lb. = 4.45 N

1. Capacity derived from multiple full-scale tests, showing the capacity of OSB sheathing in buildings constructed in accordance with the minimum requirements of the IRC.
2. The PFH bracing type in the IRC/IBC is defined as equivalent to a 4' BWP using ¾" WSP. Equivalent capacity is based on comparison testing of the PFH and ¾" OSB as compared to the published capacities as defined in the IBC and SDPWS.
3. For seismic design, reduce capacities by a factor of 1.4.
4. Interpolation between the wall heights and pier widths for the 12" PFH and 24" PFH is permitted.
5. 10'-high wall design values are provided here that use a 75% factor to reduce the 8'-high wall design values generated by test data.

- 5.2.4.5 The test data and subsequent engineering analysis provides confirmation that the performance of the DRYline® TSX (Red) Structural Sheathing 12" PFH and 24" PFH provide comparable equivalence to the Method WSP braced wall panels.
- 5.2.4.6 As detailed in Figure 3, Figure 4, Figure 5, Figure 6 or Figure 7, Figure 8, and Figure 9, the maximum allowable compressive strength of the DRYline® TSX (Red) 12" to 24" PFH is 11,156 lbs. per pier. Additional compressive capacity may be engineered into each pier.
- 5.2.4.7 There are two construction options for the PFH with DRYline® TSX (Red) Structural Sheathing.
- 5.2.4.8 PFH Assembly – Option 1:
 - 5.2.4.8.1 The DRYline® TSX (Red) Structural Sheathing Option 1 12" PFH and 24" PFH is constructed in accordance with Figure 3, Figure 4, Figure 5, and Figure 6.

5.2.4.8.2 In PFH Assembly Option 1 the piers are made up of 7/16" OSB sandwiched between nominal 2x4 studs installed flatwise with additional 2x4 studs framing the outside corner (Figure 6).

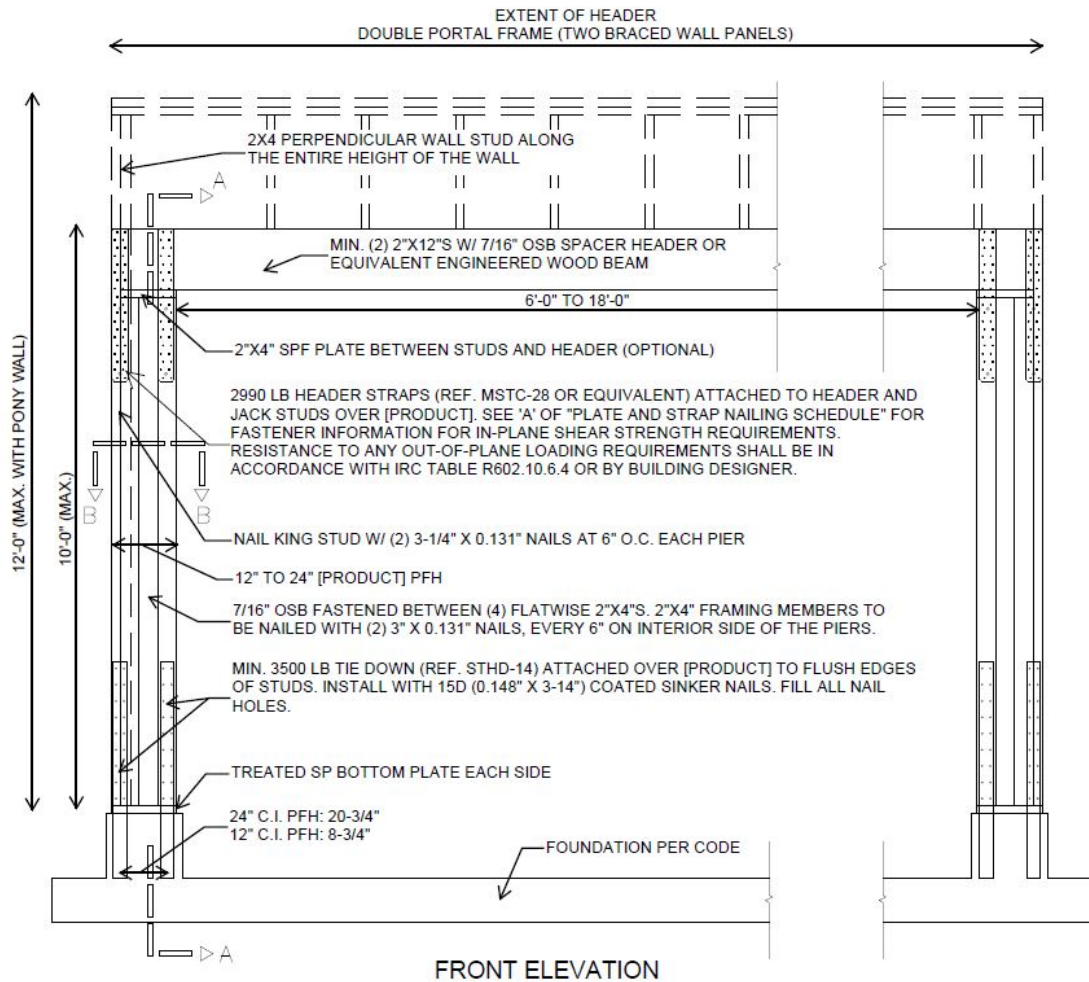


Figure 3. Construction Details of Dryline® TSX (Red) 12" to 24" PFH – Option 1

STRAP NAILING SCHEDULE

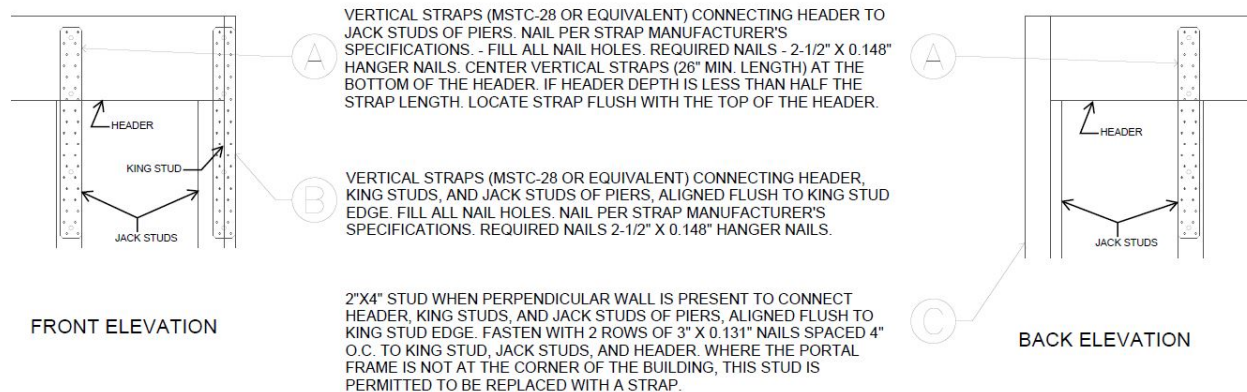


Figure 4. Header Connection Detail – Option 1

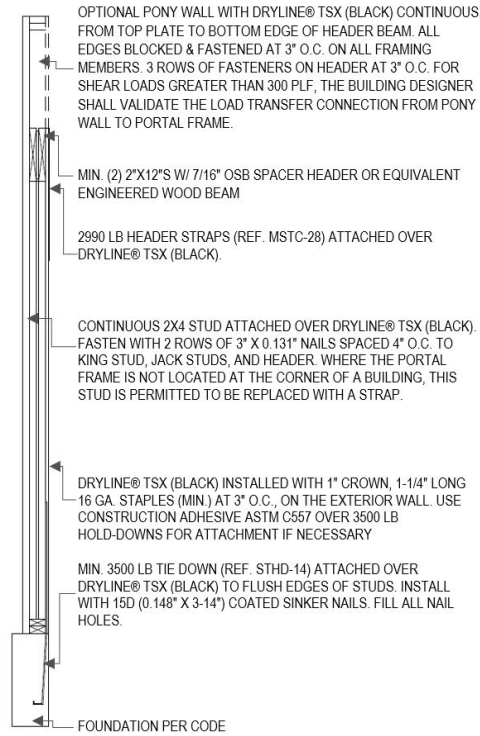


Figure 5. PFH Option 1 Section A-A

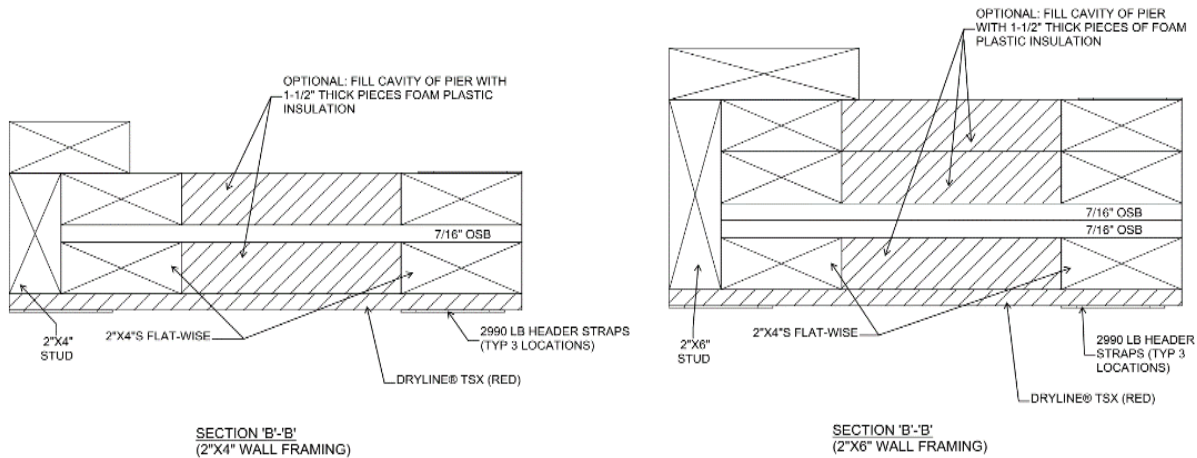


Figure 6. PFH Option 1 Section B-B

5.2.4.9 PFH Assembly – Option 2:

5.2.4.9.1 The DRYline® TSX (Red) Structural Sheathing Option 2 12" PFH and 24" PFH is constructed in accordance with Figure 7, Figure 8, and Figure 9.

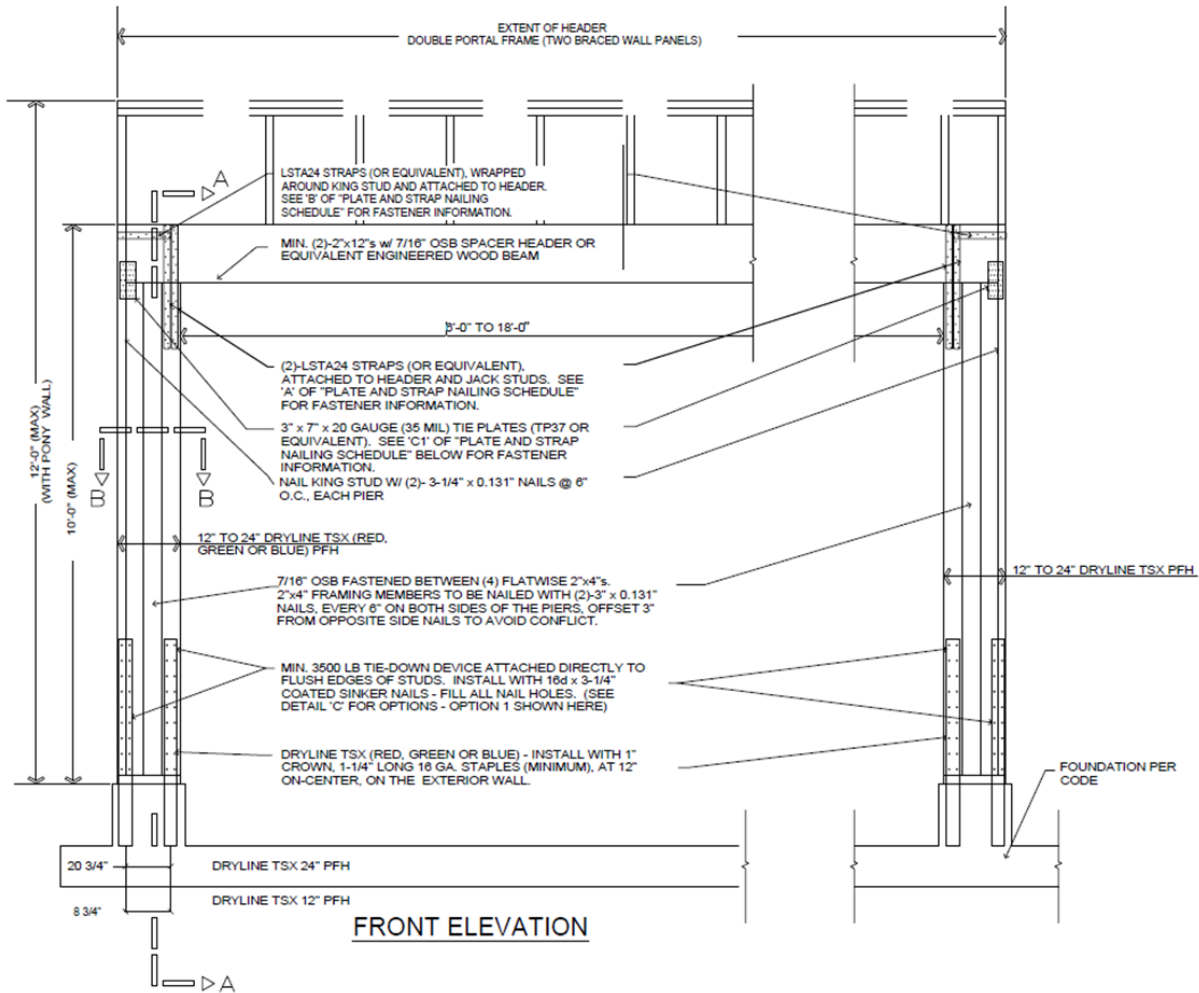


PLATE AND STRAP NAILING SCHEDULE

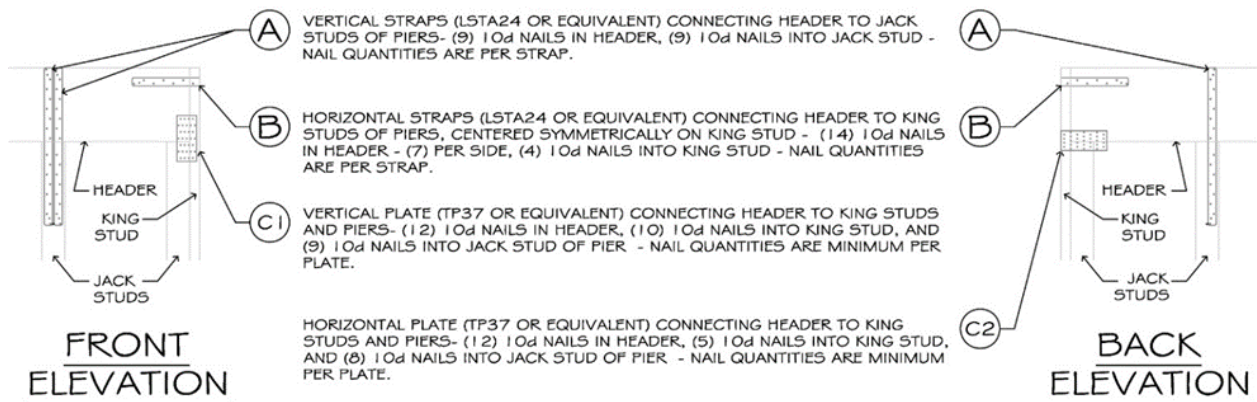


Figure 7. Construction Details of DRYline® TSX (Red) 12" to 24" PFH – Option 2

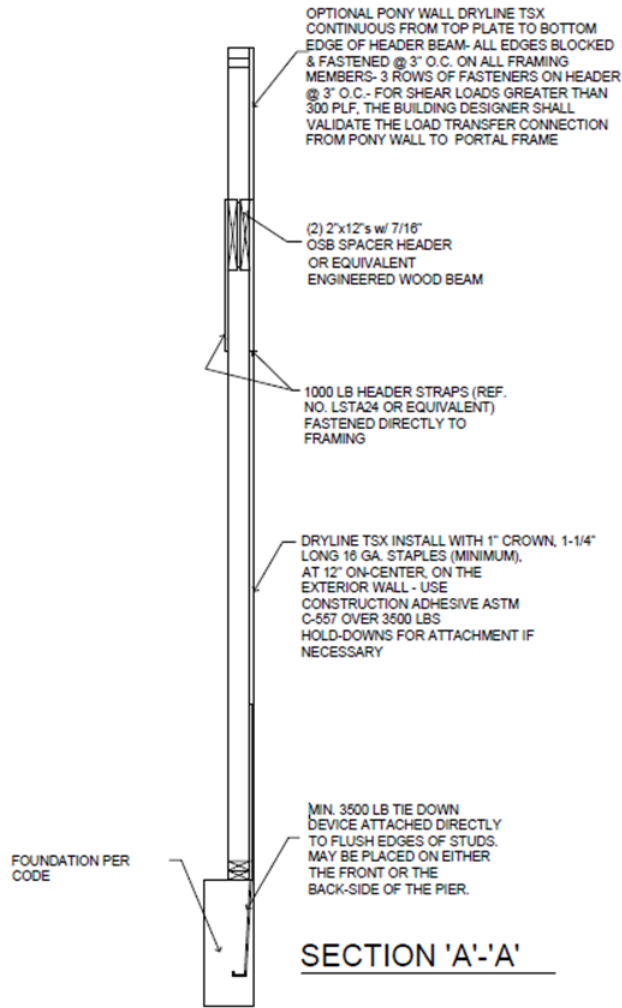
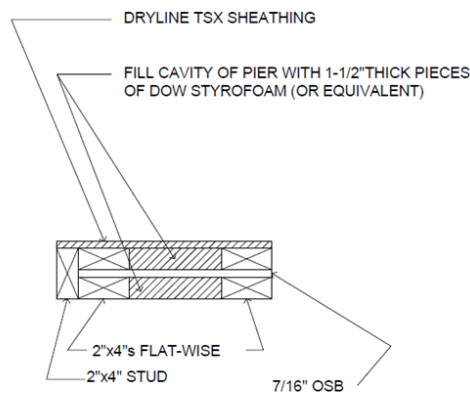


Figure 8. PFH Option 2 Section A-A



SECTION 'B'-'B'
OPTIONAL INSULATION
OF JOIST CAVITIES

Figure 9. PFH Option 2 Section B-B

5.2.5 *Alternative Prescriptive IRC Bracing Applications*

- 5.2.5.1 As an alternative to Section 5.2.3, the following provisions are permitted:
- 5.2.5.1.1 DRYline® TSX (Red) Structural Sheathing may be used on braced wall lines as an equivalent alternative to Method WSP of the IRC, when installed in accordance with [IRC Section R602.10](#) and this TER.
 - 5.2.5.1.2 DRYline® TSX (Red) Structural Sheathing may be used to brace walls of buildings as an alternative to the Continuous Wall Bracing provisions of [IRC Section R602.10.4](#).
 - 5.2.5.1.3 Required braced wall panel lengths for DRYline® TSX (Red) Structural Sheathing shall be as determined by the equivalency factor shown in Table 4, [IRC Table R602.10.3\(1\)](#), and [Table R602.10.3\(2\)](#), including all footnotes.
 - 5.2.5.1.4 Bracing lengths in these tables for Method WSP or CS-WSP shall be multiplied by the equivalency factor listed in Table 4. These braced wall line length equivalency factors are based on equivalency testing and are used to comply with Method WSP and CS-WSP of the IRC. DRYline® TSX (Red) Structural Sheathing tested equivalency factors in Table 4 allow the user to determine the length of bracing required, by multiplying the factor from Table 4 by the length shown in the WSP or CS columns in [IRC Table R602.10.3\(1\)](#), as modified by all applicable factors in [Table R602.10.3\(2\)](#). All IRC prescriptive bracing minimums, spacing requirements, and rules must also be met.

Table 4. DRYline® TSX (Red) Structural Sheathing Braced Wall Line Length Equivalency Factors Based on Equivalency Testing for Use with the IRC^{6,7}

Structural Sheathing	Joint Treatment	Maximum Stud Spacing (in)	Fastener ⁵	Fastener Spacing (edge:field) (in)	Gypsum Wallboard (GWB) ^{1,2,3}		Wind
					GWB Fastener	GWB Fastener Spacing (edge:field) (in)	SPF Framing
							Equivalency Factors ⁴ to IRC WSP or CS-WSP
DRYline® TSX (Red)	Butted	16 o.c.	15/16" Crown x 1/4" Leg, 16 ga. Galvanized Staples or 0.120" x a 1/4" Galvanized Roofing Nail	3:3	5d cooler nails or 1/4" #6 types W or S screws	8:8	0.87 ⁽¹⁾
	Lapped	16 o.c.	15/16" Crown x 1/4" Leg, 16 ga. Galvanized Staples or 0.120" x a 1/4" Galvanized Roofing Nail	3:3	5d cooler nails or 1/4" #6 types W or S screws	8:8	0.78 ⁽²⁾
	Lapped	16 o.c.	15/16" Crown x 1/4" Leg, 16 ga. Galvanized Staples or 0.120" x a 1/4" Galvanized Roofing Nail	3:3	5d cooler nails or 1/4" #6 types W or S screws	16:16	0.98 ⁽³⁾

SI: 1 in = 25.4 mm

- Where gypsum wallboard is not applied to the interior side of the wall assembly, bracing lengths shall be multiplied by a factor of 1.8.
- Where gypsum wallboard is not applied to the interior side of the wall assembly, bracing lengths shall be multiplied by a factor of 2.0.
- Where gypsum wallboard is not applied to the interior side of the wall assembly, bracing lengths shall be multiplied by a factor of 1.6.
- Factors are based on SPF framing materials.
- Fastener heads shall be installed flush to the surface of the sheathing. Staples shall be a minimum 16 gauge.
- Multiply the bracing lengths in [IRC Table R602.10.3\(1\)](#) and [IRC Table R602.10.3\(2\)](#) Method WSP or CS-WSP (continuous sheathing) as applicable, including all footnotes, by the factors shown here to establish the required bracing length.
- Valid for single top plate (advanced framing method) wall installations or double top plate wall installations.

5.2.6 Prescriptive IBC Conventional Light-Frame Wood Construction

5.2.6.1 DRYline® TSX (Red) Structural Sheathing may be used to brace exterior walls of buildings as an equivalent alternative to Method WSP of the IBC when installed with 1/2" (13 mm) gypsum fastened with a minimum 5d cooler nail or #6 Type W or S screw spaced a maximum of 8" o.c. (203 mm) at panel edges and 8" o.c. in the field. Bracing shall be in accordance with the conventional light-frame construction method of [IBC Section 2308.6](#) and this TER.

5.2.7 Performance-Based Wood-Framed Construction

5.2.7.1 DRYline® TSX (Red) Structural Sheathing panels used in wall assemblies designed as shear walls are permitted to be designed in accordance with the methodology used in SDPWS for WSP using the capacities shown in Table 5 through Table 7.

5.2.7.2 DRYline® TSX (Red) Structural Sheathing panel shear walls are permitted to resist horizontal wind load forces using the allowable shear loads (in pounds per linear foot) set forth in Table 5.

5.2.7.3 DRYline® TSX (Red) Structural Sheathing shear walls that require seismic design in accordance with [IBC Section 1613](#) shall use the seismic allowable unit shear capacities set forth in Table 6.

5.2.7.3.1 The response modification coefficient, R, system overstrength factor, Ω_0 , and deflection amplification factor, C_d , indicated in Table 6 shall be used to determine the base shear, element design forces, and design story drift in accordance with ASCE/SEI 7 Chapter 12 and Section 14.5.



5.2.7.4 DRYline® TSX (Red) Structural Sheathing panels are permitted to resist transverse wind load forces using the allowable transverse loads (in pounds per linear foot) set forth in Table 7 and the wind speeds shown in Table 8.

Table 5. Allowable Unit Shear Design Values for DRYline® TSX (Red) Structural Sheathing – Wind

Structural Sheathing	Fastener ¹	Joint Treatment ³	Maximum Stud Spacing (in)	Gypsum Wallboard ² (GWB)	Gypsum Wallboard Fastener Spacing ⁴ (edge/field) (in)	Allowable Unit Shear Capacity (plf)
DRYline® TSX (Red)	15/16" Crown x 1 1/4" Leg 16 Gauge Staple	Lapped	16 o.c.	1/2" GWB	4/16	560
					8/8	460
					8/16	440
					12/12	420
					16/16	375
		No Gyp		-	310	
		Butted		1/2" GWB	4/16	505
					8/8	410
					8/16	395
					12/12	380
	16/16		335			
	No Gyp	-	285			
	0.120 x 1 1/4" Roofing	Butted or Lapped		1/2" GWB	8/8	480

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 lb/ft = 0.0146 kN/m

1. DRYline® TSX (Red) attached with a minimum 16 gauge, 15/16" crown x 1 1/4" leg staples or 0.120" x 1 1/4" roofing nail. Fasteners are to be spaced a maximum of 3" o.c. at the edges and 3" o.c. in the field with a minimum edge distance of 3/8".
2. Gypsum attached with minimum 5d cooler nail or #6 type W or S screws 1 1/4" long. Fastener spacing shall be as required above.
3. DRYline® TSX (Red) Structural Sheathing joints shall be butted at framing members and a single row of fasteners must be applied to each panel edge into the stud below. Alternately, joints may be lapped 3/4" with a single row of fasteners along each framing member.
4. Linear interpolation between fastening patterns is permitted.

Table 6. Seismic Performance of DRYline® TSX (Red) Structural Sheathing¹

Seismic Force-Resisting System	Maximum Stud Spacing (in)	Gypsum ⁷ Wallboard (GWB)	Seismic Allowable Unit Shear Capacity ² (plf)	Apparent Shear Stiffness, G_a (kips/in)	Response Modification Factor, R^3	System Overstrength Factor, Ω_0^4	Deflection Amplification Coefficient, C_d^5	Structural System Limitations and Building Height Limit ⁶ (ft)				
								Seismic Design Category				
								B	C	D	E	F
Light-Frame (Wood) Walls Sheathed with DRYline® TSX (Red) Structural Sheathing	16 o.c.	½" GWB	330	11.0	6.5	3	4	NL	NL	65	65	65
		No GWB	230	7.5	6.5	3	4	NL	NL	65	65	65

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 lb/ft = 0.0146 kN/m

- All seismic design coefficients follow the equivalency procedures as defined in Section 3 of this TER.
- Allowable Unit shear capacity is based on a safety factor of 2.5 in accordance with ASCE/SEI 7 Chapter 12.
- Response modification coefficient, R, for use throughout ASCE/SEI 7. Note R reduces forces to a strength level, not an allowable stress level.
- The tabulated value of the overstrength factor, Ω_0 , is permitted to be reduced by subtracting one-half (0.5) for structures with flexible diaphragms.
- Deflection amplification factor, C_d , for use with ASCE/SEI 7 Sections 12.8.6, 12.8.7, and 12.9.2.
- NL = Not Limited. Heights are measured from the base of the structure as defined in ASCE/SEI 7 Section 11.2.
- Gypsum attached with minimum #6 type W or S screws 1¼" long spaced 8" o.c. at panel edges and in the field. Maximum stud spacing is 16" o.c. Gypsum attached with minimum #6 type W or S screws 1¼" long spaced 8" o.c. at panel edges and in the field. Maximum stud spacing is 16" o.c.

Table 7. Transverse Load Performance of DRYline® TSX (Red) Structural Sheathing¹

Structural Sheathing	Transverse Wind Load Resistance ¹		
	Allowable Design Value (psf)	Maximum Stud Spacing	Fastener Schedule
DRYline® TSX (Red) Structural Sheathing	120	16 o.c.	15/16" crown, 1¼" leg 16 gauge galvanized staples, 3" o.c. in the field. Staple crowns to be installed parallel to grain.

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 psf = 0.0479 kN/m²

- Design wind load shall be in accordance with [IBC Section 1609.1.1](#).

Table 8. Allowable Components and Cladding Basic Wind Speed (mph) for DRYline® TSX (Red) Structural Sheathing Used in Exterior Wall Covering Assemblies^{1,2}

Product	Basic Wind Speed V_{asd} per ASCE/SEI 7-05 (mph)	Basic Wind Speed V_{ult} per ASCE/SEI 7-10 & ASCE/SEI 7-16 (mph)
	16" o.c. Framing	16" o.c. Framing
DRYline® TSX (Red) Structural Sheathing	155	200

SI: 1 in = 25.4 mm, 1 mph = 1.61 km/h

- Allowable wind speeds are based on the following: Mean roof height 30', Exposure B, 10 sq. ft effective wind area. See the applicable building code for any adjustment need for specific building location and configuration.
- Studs spaced 16" o.c.

5.2.8 Uplift Resistance

5.2.8.1 DRYline® TSX (Red) Structural Sheathing panels are permitted to resist uplift load forces using allowable uplift loads (in pounds per linear foot) set forth in Table 9.

Table 9. Uplift Resistance for DRYline® TSX (Red) Structural Sheathing

Product	GWB	Maximum Stud Spacing (in)	Fastener ¹	Fastener Spacing (edge:field) (in)	Allowable Unit Uplift Capacity ² (plf)
DRYline® TSX (Red) Structural Sheathing	None	16 o.c.	1 ⁵ / ₁₆ " Crown x 1 ¹ / ₄ " Leg 16 ga. galvanized staple	3:3	310
	1/2" GWB				370

Sl: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Staple crowns to be installed parallel to grain.
2. Gypsum wallboard on the back (interior) side of the wall attached with 1¹/₄" long #6 Type W screws spaced 8:8 (edge:field) (in).

5.3 Water-Resistive Barrier

- 5.3.1 DRYline® TSX (Red) Structural Sheathing may be used as a WRB as prescribed in IBC Section 1403.2⁸ and IRC Section R703.2 when installed on exterior walls as described in this section.
- 5.3.2 DRYline® TSX (Red) Structural Sheathing shall be installed in the vertical or horizontal orientation with board joints placed directly over exterior framing (e.g., studs, plates, or blocking) spaced a maximum of 16" (406 mm) o.c. The fasteners used to attach the board shall be installed in accordance with Section 6.
- 5.3.3 All seams and joints between boards shall be overlapped 3/4" (19 mm) or covered by minimum 1.5" (38 mm) wide DRYline® Sheathing Tape or equivalent.
- 5.3.4 DRYline® TSX (Red) Structural Sheathing may be installed as a WRB in a non-structural capacity with the fasteners used to attach the board installed in accordance with Section 5.5. All butt joints between sheathing panels shall be sealed with minimum 1.5" (38 mm) wide DRYline® Sheathing Tape or equivalent.
- 5.3.5 Flashing must be installed at all sheathing penetrations and shall comply with the all applicable code sections.
- 5.3.6 Where DRYline® TSX (Red) Structural Sheathing is used intermittently along a braced wall line, DRYline® TSX (Green) Structural Sheathing may be used as infill between the DRYline® TSX (Red) Structural Sheathing panels. In this application, the WRB is maintained, provided all seams and joints between boards are overlapped 3/4" (19 mm) or covered by an approved construction tape.
- 5.3.7 DRYline® TSX (Red) Structural Sheathing has water-resistance properties as shown on Table 10.

Table 10. DRYline® TSX (Red) Structural Sheathing Water-Resistance Properties

Property	Test Method	Value
Water Vapor Transmission	ASTM E96	< 0.3 Perm

5.4 Air Barrier

5.4.1 DRYline® TSX (Red) Structural Sheathing is qualified as an air barrier material as prescribed in IRC Section N1102.4.1.1, IECC Section R402.4.1.1, IECC Section C402.5.1, and IECC Section C402.5.1.3⁹ in accordance with ASTM E2178.

⁸ 2015 IBC Section 1404.2

⁹ 2018 IECC Section C402.5.1.2.1

- 5.4.2 When used as part of a continuous air barrier assembly in a structural application, DRYline® TSX (Red) Structural Sheathing shall be installed in accordance with Section 6. When installed as part of a continuous air barrier in a non-structural application the fasteners used to attach the board may be installed in accordance with Section 5.5.
 - 5.4.2.1 Additionally, all sheathing panel edges at the top and bottom of the wall assemblies and all joints between sheathing panels shall be sealed in accordance with IRC Section N1102.4.1.1, IECC Section R402.4.1.1, and IECC Section C402.5.1.
 - 5.4.2.2 DRYline® TSX (Red) Structural Sheathing has the air permeability as shown in Table 11.

Table 11. Air Barrier Material Properties

Product	Air Permeability (L/s*m ²)
DRYline® TSX (Red) Structural Sheathing ¹	< 0.02
1. Tested in accordance with ASTM E2178.	

5.5 Non-Structural Applications

- 5.5.1 Where other means of wall bracing are provided, or are not required, and an approved exterior wall covering capable of separately resisting loads perpendicular to the face of the walls is installed over the sheathing, DRYline® TSX (Red) Structural Sheathing may be used.
- 5.5.2 The sheathing panels are applied to wall framing with minimum 0.120" x 1¼" (3 mm x 32 mm) galvanized roofing nails or 16 gauge galvanized staples having a 15/16" (11 mm) crown and 1¼" (32 mm) leg lengths.
- 5.5.3 Fastener spacing shall be a maximum of 6" (152 mm) at the edges and 12" (305 mm) on intermediate members.
 - 5.5.3.1 Stud spacing shall be a maximum of 24" (610 mm) o.c.
 - 5.5.3.2 Minimum fastener penetration into the framing members is ¾" (19 mm).
- 5.5.4 Where the application falls outside of the performance evaluation, conditions of use and/or installation requirements set forth herein, alternative techniques shall be permitted in accordance with accepted engineering practice and experience. This includes but is not limited to the following areas of engineering: mechanics or materials, structural, building science, and fire science.

6 Installation

- 6.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this TER, and the applicable building code.
- 6.2 In the event of a conflict between the manufacturer installation instructions and this TER, the more restrictive shall govern.
- 6.3 General
 - 6.3.1 DRYline® TSX (Red) Structural Sheathing shall be installed in accordance with the manufacturer published installation instructions and this TER (See Figure 10 and Figure 11).
 - 6.3.2 A copy of the manufacturer published installation instructions shall be available at all times on the jobsite during installation.
 - 6.3.3 Where required, gypsum wallboard shall be a minimum ½" (13 mm) thickness.
- 6.4 Orientation
 - 6.4.1 DRYline® TSX (Red) Structural Sheathing must be installed vertically or horizontally with all panel edges supported by framing or blocking.
 - 6.4.2 DRYline® TSX (Red) Structural Sheathing must be installed over studs, with framing that has a nominal thickness of not less than 2" (51 mm) and spaced a maximum of 16" (406 mm) o.c.

6.5 Fastener Type

6.5.1 DRYline® TSX (Red) Structural Sheathing

- 6.5.1.1 Minimum 15/16" crown x 1¼" leg, 16 gauge galvanized staples installed with the underside of the crown flush with the surface of the sheathing.
- 6.5.1.2 Minimum 0.120" x 1¼" (3 mm x 32 mm) galvanized roofing nail installed with the underside of the head flush with the surface of the sheathing.

6.5.2 Gypsum Wallboard

- 6.5.2.1 Where required, gypsum wallboard shall be installed with a minimum:
 - 6.5.2.1.1 #6 x 1¼" (32 mm) Type W or S screws.
 - 6.5.2.1.2 5d cooler nails.

6.6 Fastener Spacing

6.6.1 DRYline® TSX (Red) Structural Sheathing

- 6.6.1.1 Maximum of 3" o.c. (76 mm) along the edge and 3" o.c. in the field.

6.6.2 Gypsum Wallboard

- 6.6.2.1 For IRC and IBC prescriptive applications, gypsum fasteners shall be spaced in accordance with Table 4. For engineered design, see Table 5.

6.7 Fastener Edge Distance

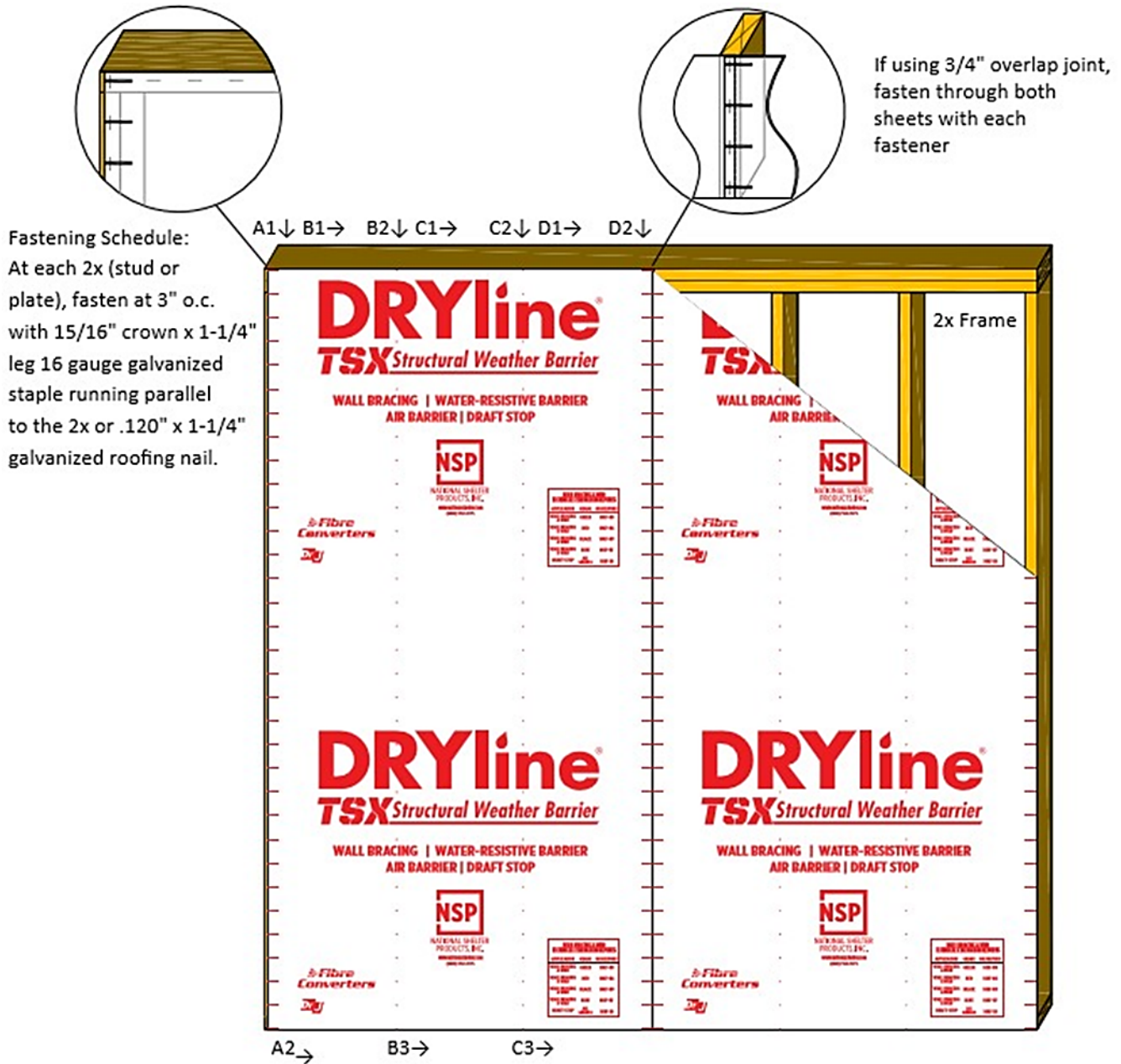
- 6.7.1 Fastener edge distance is a minimum of ⅜" (10 mm) for both DRYline® TSX (Red) Structural Sheathing and gypsum.
- 6.7.2 Always fasten staples parallel to the framing member.

6.8 Treatment of Joints

- 6.8.1 DRYline® TSX (Red) Structural Sheathing joints shall be lapped ¾" (19 mm) with a single row of fasteners along each framing member.
 - 6.8.1.1 Alternately, joints may be butted at framing members, and a single row of fasteners must be applied to each panel edge into the stud below.
- 6.8.2 Do not tack DRYline® TSX (Red) Structural Sheathing to framing but fasten each panel completely once fastening begins.

6.9 Window Treatments

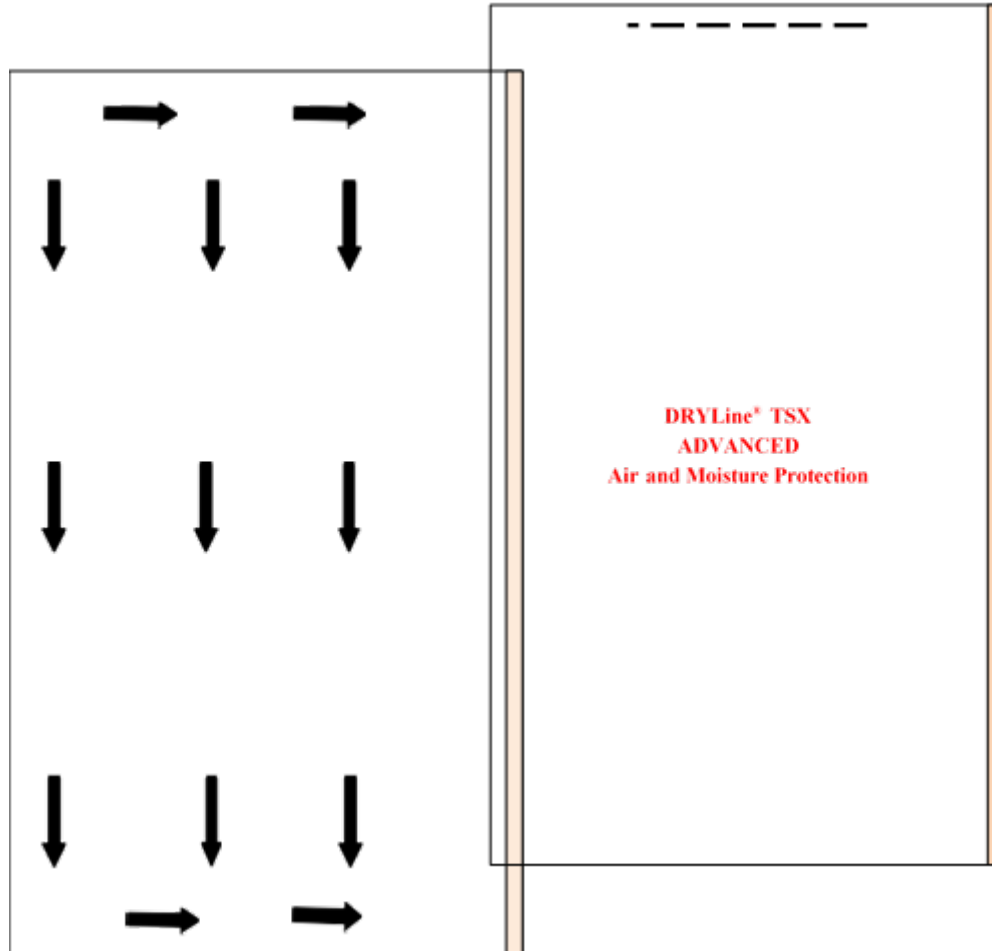
- 6.9.1 If windows are made to accommodate traditional ½" (13 mm) sheathing materials, order windows with adjustable nailing fins from the supplier. Door brick moldings may be planed or routed ⅜" (10 mm), in order to accommodate the different sheathing thickness, either at the jobsite or by the millwork supplier.
- 6.9.2 DRYline® TSX (Red) Structural Sheathing must be installed with appropriate flashing and counter flashing in conformance with accepted building standards and in compliance with local building codes and the flashing manufacturer installation instructions.



Fastening Schedule:

- Step A – (A1) starting in the top left corner, fasten down the left side of the sheet and then (A2) across the bottom stopping at the next vertical 2x.
- Step B – (B1) starting in the top left corner, fasten across the top of the sheet stopping at the next vertical 2x, then (B2) down that 2x starting at the top, and then (B3) across the bottom stopping at the next vertical 2x.
- Step C – Repeat step B.
- Step D – (D1) starting at the previous vertical 2x, fasten across the top of the sheet stopping at the next vertical 2x. If the last sheet or a butt joint, (D2) fasten starting at the top of the last 2x. If installing another sheet with an overlapping joint, overlap the next sheet and repeat starting with Step A, fastening through both sheets with each fastener.

Figure 10. Installation Instructions



(USE TER SPECIFIED FASTENER SCHEDULE)

Steps:

1. From the top un-taped corner fasten horizontally leaving the last 3" unfastened.
2. Again, from the top un-taped corner fasten downward toward the bottom corner.
3. Repeat the same downward fastening along each vertical framing member leaving the framing member nearest the taped edge unfastened.
4. Fasten along the bottom plate stopping 3" from the taped edge.
5. Position the next panel adjacent to the first with its un-taped vertical edge lapped 3/4" over the first panel's taped edge.
6. Fasten the new panel along the top plate away from the vertical lapped seam.
7. From the top, peel-away the tape release liner at the lapped seam (always grasp the release liner dry edge, taking care to avoid damaging the DRYline® TSX ADVANCED AMP protective coating).
8. Press the seam together by smoothing it with hand pressure or a roller.
9. Fasten downward along the lapped and taped seam.
10. Repeat Steps 3-8 with each successive panel.

Figure 11. DRYline® TSX Advanced Air and Moisture Protection (AMP Red) Installation Instructions

7 Substantiating Data

- 7.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:
- 7.1.1 Lateral load testing in accordance with ASTM E2126 and analysis per ASTM D7989.
 - 7.1.2 Transverse load testing in accordance with ASTM E330.
 - 7.1.3 Uplift load testing in accordance with ASTM E72.
 - 7.1.4 Water-resistive barrier testing in accordance with ASTM E331.
 - 7.1.5 Water vapor transmission testing in accordance with ASTM E96.
 - 7.1.6 Air barrier material testing in accordance with ASTM E2178.
- 7.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies (i.e., ANAB accredited agencies), approved sources (i.e., registered design professionals [RDP]), and/or professional engineering regulations. Accuracy of external test data and resulting analysis is relied upon.
- 7.3 Where pertinent, DrJ's analysis is based upon provisions that have been codified into law through state or local adoption of codes and standards. The developers of these codes and standards are responsible for the reliability of published content. DrJ's engineering practice may use a code-adopted provision as the control sample. A control sample versus a test sample establishes materials as being equivalent to the code-adopted provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.
- 7.4 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, Listings, certified reports, duly authenticated reports from approved agencies, and research reports prepared by approved agencies and/or approved sources provided by the suppliers of any raw materials. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this TER, may be dependent upon published design properties by others.
- 7.5 Testing and engineering analysis: The strength, rigidity and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.¹⁰

8 Findings

- 8.1 As delineated in Section 3, the DRYline® TSX (Red) and TSX ADVANCED AMP (Red) Structural Sheathing have performance characteristics that were tested and/or meet pertinent standards and are suitable for use pursuant to its specified purpose.
- 8.2 When used and installed in accordance with this TER and the manufacturer installation instructions, DRYline® TSX (Red) and TSX ADVANCED AMP (Red) Structural Sheathing shall be approved for the following applications:
- 8.2.1 Lateral load resistance due to wind and seismic loads carried by shear walls.
 - 8.2.2 Use as an equivalent alternative to the CS-PF as described in IRC Section R602.10.5 and IRC Section R602.10.6.4.
 - 8.2.3 Use as an equivalent alternative to Method PFH as described in IRC Section R602.10.6.2.
 - 8.2.4 Transverse load resistance due to components and cladding pressures on building surfaces.
 - 8.2.5 Uplift load resistance due to wind uplift loads carried by the walls.
 - 8.2.6 Performance for use as a WRB in accordance with IBC Section 1403.2¹¹ and IRC Section R703.2.

¹⁰ See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.

¹¹ 2015 IBC Section 1404.2

- 8.2.7 Performance for use as an air barrier material in accordance with IRC Section N1102.4.1.1, IECC Section R402.4.1.1, IECC Section C402.5.1, and IECC Section C402.5.1.3.¹²
- 8.3 These materials have been evaluated in the context of the codes listed in Section 2 and are compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this TER, they are listed here:
- 8.3.1 No known variations
- 8.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from National Shelter Products, Inc.
- 8.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10)¹³ are similar) in pertinent part states:
- 104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons the alternative was not approved.
- 8.6 Approved:¹⁴ Building codes require that the building official shall accept duly authenticated reports¹⁵ or research reports¹⁶ from approved agencies and/or approved sources (i.e., licensed RDP) with respect to the quality and manner of use of new products, materials, designs, services, assemblies, or methods of construction.
- 8.6.1 Acceptability of an approved agency, by a building official, is performed by verifying that the agency is accredited by a recognized accreditation body of the International Accreditation Forum (IAF).
- 8.6.2 Acceptability of a licensed RDP, by a building official, is performed by verifying that the RDP and/or their business entity is listed by the licensing board of the relevant jurisdiction.
- 8.6.3 Federal law, Title 18 US Code Section 242, requires that where the alternative product, material, service, design, assembly, and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved, as denial without written reason deprives a protected right to free and fair competition in the marketplace.
- 8.7 DrJ is an engineering company, employs RDPs and is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131.
- 8.8 Through ANAB accreditation and the IAF Multilateral Agreements, this TER can be used to obtain material approval in any jurisdiction or country that has IAF MLA Members and Signatories to meet the Purpose of the MLA – “*certified once, accepted everywhere.*”

¹² 2018 IECC Section C402.5.1.2.1

¹³ 2018 IFC Section 104.9

¹⁴ Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC Section 201.4 where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.

¹⁵ <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1>

¹⁶ <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2>

9 Conditions of Use

- 9.1 Material properties shall not fall outside the boundaries defined in Section 3.
- 9.2 As defined in Section 3, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.
- 9.3 As listed herein, DRYline® TSX (Red) and TSX ADVANCED AMP (Red) Structural Sheathing shall not be used:
 - 9.3.1 As a nailing base.
 - 9.3.2 To resist horizontal loads from concrete and masonry walls.
- 9.4 DRYline® TSX (Red) Structural Sheathing may have penetrations of up to 4" without the need for additional blocking. Penetrations larger than 4" require solid blocking around the perimeter of the penetration and the DRYline® TSX (Red) Structural Sheathing shall be fastened to the blocking at 3" o.c. Limit penetrations to one per wall stud cavity unless blocking is installed around the perimeter of each penetration.
- 9.5 When DRYline® TSX (Red) Structural Sheathing is not installed for use as wall bracing, as described in this TER, the walls shall be braced by other materials in accordance with the applicable code.
- 9.6 When used as a WRB, DRYline® TSX (Red) Structural Sheathing seams shall be overlapped $\frac{3}{4}$ " (19 mm) or covered with minimum 1.5" (38 mm) wide DRYline® Sheathing Tape or equivalent.
- 9.7 When used as part of a continuous air barrier assembly, all sheathing panel edges at the top and bottom of the wall assemblies and all joints between sheathing panels shall be sealed.
- 9.8 When used in accordance with the IBC in Seismic Design Categories C, D, E, or F, special inspections shall comply with [IBC Section 1705.13](#).¹⁷
- 9.9 When used in accordance with the IBC in high wind areas, special inspections shall comply with [IBC Section 1705.12](#).¹⁸
- 9.10 Loads applied shall not exceed those recommended by the manufacturer as follows:
 - 9.10.1 Allowable shear loads do not exceed values in Table 5 for wind loads and Table 6 for seismic loads.
 - 9.10.2 Transverse design loads shall not exceed those described in Table 7, unless an approved exterior wall covering capable of separately resisting loads perpendicular to the face of the walls is installed over the sheathing.
 - 9.10.3 Allowable uplift loads shall not exceed values in Table 9.
- 9.11 The manufacturer installation instructions shall be available on the jobsite for inspection.
- 9.12 All panel edges shall be supported by wall framing or solid blocking a minimum of 2" (51 mm) nominal in thickness.
- 9.13 DRYline® TSX (Red) Structural Sheathing is manufactured in Constantine, Michigan, under a quality control program with quality control inspections in accordance with [IRC Section R109.2](#), [IBC Section 110.3.10](#),¹⁹ and [IBC Section 110.4](#).
- 9.14 When required by regulation and enforced by the [building official](#), also known as the authority having jurisdiction (AHJ) in which the project is to be constructed:
 - 9.14.1 Any calculations incorporated into the construction documents that are required to show compliance with this TER shall conform to accepted engineering practice and shall be approved when requirements of the pertinent regulations are met.
 - 9.14.2 This TER and the installation instructions shall be submitted at the time of [permit](#) application.

¹⁷ [2018 IBC Section 1705.12](#)

¹⁸ [2018 IBC Section 1705.11](#)

¹⁹ [2018 IBC Section 110.3.9](#), [2015 IBC Section 110.3.8](#)

- 9.14.3 These materials have an internal quality control program and a third-party quality assurance program.
- 9.14.4 At a minimum, these materials shall be installed per Section 6 of this TER.
- 9.14.5 The review of this TER by the AHJ shall be in compliance with IBC Section 104 and IBC Section 105.4.
- 9.14.6 These materials have an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.4, IBC Section 110.4, IBC Section 1703, IRC Section R104.4, and IRC Section R109.2.
- 9.14.7 The application of these materials in the context of this TER is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3 and IRC Section R109.2, and any other regulatory requirements that may apply.
- 9.15 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (e.g., owner or RDP).
- 9.16 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the owner or the owner's authorized agent.

10 Identification

- 10.1 The materials listed in Section 1.1 are identified by a label on the board or packaging material bearing the manufacturer name, product name, TER number, and other information to confirm code compliance.
- 10.2 Additional technical information can be found at fibreconverters.com or nationalshelter.com.

11 Review Schedule

- 11.1 This TER is subject to periodic review and revision. For the most recent version, visit drjcertification.org.
- 11.2 For information on the current status of this TER, contact DrJ Certification.

12 Approved for Use Pursuant to US and International Legislation Defined in Appendix A

- 12.1 DRYline® TSX (Red) and TSX ADVANCED AMP (Red) Structural Sheathing are included in this TER published by an approved agency that is concerned with evaluation of products or services, maintains periodic inspection of the production of listed materials or periodic evaluation of services, and whose TER Listing states either that the material, product, or service meets identified standards or has been tested and found suitable for a specified purpose. This TER meets the legislative intent and definition of being acceptable to the AHJ.

1 Appendix A: Legislation that Authorizes AHJ Approval

- 1.1 **Fair Competition:** State legislatures have adopted Federal regulations for the examination and approval of building code referenced and alternative products, materials, designs, services, assemblies and/or methods of construction that:
 - 1.1.1 Advance Innovation,
 - 1.1.2 Promote competition so all businesses have the opportunity to compete on price and quality in an open market on a level playing field unhampered by anticompetitive constraints, and
 - 1.1.3 Benefit consumers through lower prices, better quality, and greater choice.
- 1.2 **Adopted Legislation:** The following local, state, and federal regulations affirmatively authorize DRYline® TSX (Red) and TSX ADVANCED AMP (Red) Structural Sheathing to be approved by AHJs, delegates of building departments, and/or delegates of an agency of the federal government:
 - 1.2.1 Interstate commerce is governed by the Federal Department of Justice to encourage the use of innovative products, materials, designs, services, assemblies and/or methods of construction. The goal is to “protect economic freedom and opportunity by promoting free and fair competition in the marketplace.”
 - 1.2.2 Title 18 US Code Section 242 affirms and regulates the right of individuals and businesses to freely and fairly have new products, materials, designs, services, assemblies and/or methods of construction approved for use in commerce. Disapproval of alternatives shall be based upon non-conformance with respect to specific provisions of adopted legislation, and shall be provided in writing stating the reasons why the alternative was not approved, with reference to the specific legislation violated.
 - 1.2.3 The federal government and each state have a public records act. In addition, each state also has legislation that mimics the federal Defend Trade Secrets Act 2016 (DTSA).
 - 1.2.3.1 Compliance with public records and trade secret legislation requires approval through the use of listings, certified reports, Technical Evaluation Reports, duly authenticated reports and/or research reports prepared by approved agencies and/or approved sources.
 - 1.2.4 For new materials²⁰ that are not specifically provided for in any building code, the design strengths and permissible stresses shall be established by tests, where suitable load tests simulate the actual loads and conditions of application that occur.
 - 1.2.5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design using accepted engineering practice.²¹

²⁰ <https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2>

²¹ [IBC 2021, Section 1706.1 Conformance to Standards](#)

- 1.3 **Approved²² by Los Angeles:** The Los Angeles Municipal Code (LAMC) states in pertinent part that the provisions of LAMC are not intended to prevent the use of any material, device, or method of construction not specifically prescribed by LAMC. The Department shall use Part III, Recognized Standards in addition to Part II, Uniform Building Code Standards of Division 35, Article 1, Chapter IX of the LAMC in evaluation of products for approval where such standard exists for the product or the material and may use other approved standards, which apply. Whenever tests or certificates of any material or fabricated assembly are required by Chapter IX of the LAMC, such tests or certification shall be made by a testing agency approved by the Superintendent of Building to conduct such tests or provide such certifications. The testing agency shall publish the scope and limitation(s) of the listed material or fabricated assembly.²³ The Superintendent of Building roster of approved testing agencies is provided by the Los Angeles Department of Building and Safety (LADBS). The Center for Building Innovation (CBI) Certificate of Approval License is TA24945. Tests and certifications found in a CBI Listing are LAMC approved. In addition, the Superintendent of Building shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the California Building Code (CBC) Section 1707.1.²⁴
- 1.4 **Approved by Chicago:** The Municipal Code of Chicago (MCC) states in pertinent part that an Approved Agency is a Nationally Recognized Testing Laboratory (NRTL) acting within its recognized scope and/or a certification body accredited by the American National Standards Institute (ANSI) acting within its accredited scope. Construction materials and test procedures shall conform to the applicable standards listed in the MCC. Sufficient technical data shall be submitted to the building official to substantiate the proposed use of any product, material, service, design, assembly and/or method of construction not specifically provided for in the MCC. This technical data shall consist of research reports from approved sources (i.e., MCC defined Approved Agencies).
- 1.5 **Approved by New York City:** The NYC Building Code 2022 (NYCBC) states in pertinent part that an approved agency shall be deemed²⁵ an approved testing agency via ISO/IEC 17025 accreditation, an approved inspection agency via ISO/IEC 17020 accreditation, and an approved product evaluation agency via ISO/IEC 17065 accreditation. Accrediting agencies, other than federal agencies, must be members of an internationally recognized cooperation of laboratory and inspection accreditation bodies subject to a mutual recognition agreement²⁶ (i.e., ANAB, International Accreditation Forum (IAF), etc.).

²² See section 8.3 for the distilled building code definition of Approved.

²³ Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES

²⁴ https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1

²⁵ New York City, The Rules of the City of New York, § 101-07 Approved Agencies

²⁶ New York City, The Rules of the City of New York, § 101-07 Approved Agencies

- 1.6 **Approved by Florida:** Statewide approval of products, methods, or systems of construction shall be approved, without further evaluation, by 1) A certification mark or listing of an approved certification agency, 2) A test report from an approved testing laboratory, 3) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity; 4) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a professional engineer or architect, licensed in Florida. For local product approval, products or systems of construction shall demonstrate compliance with the structural wind load requirements of the Florida Building Code (FBC) through one of the following methods; 1) A certification mark, listing, or label from a commission-approved certification agency indicating that the product complies with the code; 2) A test report from a commission-approved testing laboratory indicating that the product tested complies with the code; 3) A product-evaluation report based upon testing, comparative or rational analysis, or a combination thereof, from a commission-approved product evaluation entity which indicates that the product evaluated complies with the code; 4) A product-evaluation report or certification based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a Florida professional engineer or Florida registered architect, which indicates that the product complies with the code; 5) A statewide product approval issued by the Florida Building Commission. The Florida Department of Business and Professional Regulation (DBPR) website provides a listing of companies certified as a Product Evaluation Agency (i.e., EVLMiami 13692), a Product Certification Agency (i.e., CER10642), and as a Florida Registered Engineer (i.e., ANE13741).
- 1.7 **Approved by Miami-Dade County (i.e., Notice of Acceptance [NOA]):** A Florida statewide approval is an NOA. An NOA is a Florida local product approval. By Florida law, Miami-Dade County shall accept the statewide and local Florida Product Approval as provided for in Florida legislation 553.842 and 553.8425.
- 1.8 **Approved by New Jersey:** Pursuant to Building Code 2018 of New Jersey in IBC Section 1707.1 General,²⁷ it states: “In the absence of approved rules or other approved standards, the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the administrative provisions of the Uniform Construction Code (N.J.A.C. 5:23)”.²⁸ Furthermore N.J.A.C 5:23-3.7 states: Municipal approvals of alternative materials, equipment, or methods of construction. **(a) Approvals:** Alternative materials, equipment, or methods of construction shall be approved by the appropriate subcode official provided the proposed design is satisfactory and that the materials, equipment, or methods of construction are suitable for the intended use and are at least the equivalent in quality, strength, effectiveness, fire resistance, durability and safety of those conforming with the requirements of the regulations. 1. A field evaluation label and report or letter issued by a nationally recognized testing laboratory verifying that the specific material, equipment, or method of construction meets the identified standards or has been tested and found to be suitable for the intended use, shall be accepted by the appropriate subcode official as meeting the requirements of (a) above. 2. Reports of engineering findings issued by nationally recognized evaluation service programs, such as, but not limited to, the Building Officials and Code Administrators (BOCA), the International Conference of Building Officials (ICBO), the Southern Building Code Congress International (SBCCI), the International Code Council (ICC), and the National Evaluation Service, Inc., shall be accepted by the appropriate subcode official as meeting the requirements of (a) above. The New Jersey Department of Community Affairs has confirmed that technical evaluation reports, from any accredited entity listed by ANAB, meets the requirements of item 2 given that the listed entities are no longer in existence and/or do not provide “reports of engineering findings”.

²⁷ https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1

²⁸ <https://www.nj.gov/dca/divisions/codes/codreg/ucc.html>

- 1.9 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards:** Pursuant to Title 24, Subtitle B, Chapter XX, [Part 3282.14](#)²⁹ and [Part 3280](#),³⁰ the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform with the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow: 1) “All construction methods shall be in conformance with accepted engineering practices”; 2) “The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.”; and 3) “The design stresses of all materials shall conform to accepted engineering practice.”
- 1.10 **Approved by US, Local, and State Jurisdictions in General:** In all other local and state jurisdictions, the regulations require approval per Section 8 above.
- 1.11 **Approved by International Jurisdictions:** The [USMCA](#) and [GATT](#) agreements provide for approval of innovative materials, products, designs, services, assemblies and/or methods of construction through the [Technical Barriers to Trade](#) agreements and the [International Accreditation Forum \(IAF\) Multilateral Recognition Arrangement \(MLA\)](#), where these agreements:
- 1.11.1 Permit participation of [conformity assessment bodies](#) located in the territories of other Members (defined as GATT Countries) under conditions no less favourable than those accorded to bodies located within their territory or the territory of any other country.
 - 1.11.2 State that [conformity assessment procedures](#) (i.e., ISO/IEC 17020, 17025, 17065, etc.) are prepared, adopted, and applied so as to grant access for suppliers of like products originating in the territories of other Members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.
 - 1.11.3 State that conformity assessment procedures are not prepared, adopted, or applied with a view to or with the effect of creating unnecessary obstacles to international trade. This means that conformity assessment procedures shall not be more strict or be applied more strictly than is necessary to give the importing Member adequate confidence that products conform to the applicable technical regulations or standards.
 - 1.11.4 **Approved:** The [purpose of the IAF MLA](#) is to ensure mutual recognition of accredited certification and validation/verification statements between signatories to the MLA, and subsequently acceptance of accredited certification and validation/verification statements in many markets based on one accreditation for the timely approval of innovative materials, products, designs, services, assemblies and/or methods of construction. Accreditations granted by IAF MLA signatories are recognised worldwide based on their equivalent accreditation programs, therefore reducing costs and adding value to businesses and consumers.

²⁹ <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14>

³⁰ <https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280>



Issue Date: January 7, 2022
Subject to Renewal: January 1, 2024

FBC Supplement to TER 1407-06

REPORT HOLDER: National Shelter Products, Inc.

1 Evaluation Subject

1.1 DRYline® TSX (Red) and TSX ADVANCED AMP (Red) Structural Sheathing

2 Purpose and Scope

2.1 Purpose

2.1.1 The purpose of this Technical Evaluation Report (TER) supplement is to show DRYline® TSX (Red) and TSX ADVANCED AMP (Red) Structural Sheathing, recognized in TER 1407-06, has also been evaluated for compliance with the codes listed below as adopted by the Florida Building Commission.

2.2 Applicable Code Editions

2.2.1 FBC-B—17, 20: Florida Building Code – Building

2.2.2 FBC-R—17, 20: Florida Building Code – Residential

3 Conclusions

3.1 DRYline® TSX (Red) and TSX ADVANCED AMP (Red) Structural Sheathing, described in TER 1407-06, comply with the FBC-B and FBC-R and are subject to the conditions of use described in this supplement.

3.2 Where there are variations between the IBC and IRC and the FBC-B and FBC-R applicable to this TER, they are listed here.

3.2.1 FBC-B Section 104.4, Section 110.3.10, Section 110.4, Section 1705.12, and Section 1705.13 are reserved.

3.2.2 FBC-R Section R104, Section R109, and Section R602.10 are reserved.

3.2.3 FBC-B Section 110.3 replaces IBC Section 110.3.

3.2.4 FBC-B Section 1404.2 replaces IBC Section 1403.2.

3.2.5 FBC-B Section 1609.1.1 replaces IBC Section 1609.1.1.

3.2.6 FBC-R Section N1102.4.1.1 replaces IRC Section N1102.4.1.1.

3.2.7 FBC-R Section R301.1 replaces IRC Section R301.1.

4 Conditions of Use

4.1 DRYline® TSX (Red) and TSX ADVANCED AMP (Red) Structural Sheathing, described in TER 1407-06, must comply with all of the following conditions:

4.1.1 All applicable sections in TER 1407-06

4.1.2 The design, installation, and inspections are in accordance with additional requirements of FBC-B Chapter 16 and Chapter 17, as applicable.